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10/774,099	02/06/2004	Hung-Eil Kim	H1647	8365

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RENNER, OTTO, BOISSELLE & SKLAR, LLP (AMDS)  
1621 EUCLID AVE - 19TH FLOOR  
CLEVELAND, OH 44115-2191

EXAMINER

RUGGLES, JOHN S

ART UNIT PAPER NUMBER

1756

DATE MAILED: 07/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/774,099

Applicant(s)

KIM, HUNG-EIL

Examiner

John Ruggles

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/28/04 & 2/6/04.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2/6/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Specification*

The abstract of the disclosure is objected to because it is not written in the proper language, which should be amended as follows: --A method of fabricating a photomask having a pellicle on a photomask substrate ~~is disclosed. The method that~~ facilitates accurate measurement of a critical dimension on the photomask ~~critical dimension~~, without requiring ~~[[the]]~~ removal of the pellicle from the photomask substrate. A first pattern is transferred onto ~~[[a]]~~ the photomask substrate in a first area~~[[,]]~~ and at least one test pattern is transferred onto the photomask substrate outside of the first area. ~~[[A]]~~ The pellicle is attached to the photomask substrate~~[[,]]~~ ~~and the pellicle to cover[[s]] the first area, but does not cover the at least one test pattern.--~~.

Correction is required. See MPEP § 608.01(b).

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: (1) at page 1 line 7, "without removing a pellicle" should be changed to --without removing a pellicle from the mask--; (2) at page 1 line 20, "A pellicle is a thin (~1 um) polymer film" should be corrected to --[[A]] The pellicle is a thin (~1 ~~[[um]]~~ μm) polymer film-- (in which the unit --μm-- represents "micrometer"); (3) at page 2 line 4, "the electron beam and other machines" should be changed (to e.g., --[[the]] an electron beam machine and other machines--, etc.); and (4) both at page 3 lines 15-16 and again at page 15 line 16, the phrase "similar in magnitude" is unclear as being vague and indefinite with regard to the scale or degree of

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similarity that was intended between the first mask pattern critical dimension (CD) and the test pattern CD, at both occurrences. Note that due to the number of errors, those listed here are merely examples of the corrections needed and do not represent an exhaustive list thereof.

Appropriate correction is required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 line 2 and in claim 7 lines 1-2, both occurrences of the phrase “the photomask critical dimension” lack proper antecedent basis. However, for the purpose of this Office action and in order to advance the prosecution of this application, both occurrences of this phrase have been interpreted to mean --a critical dimension on the photomask ~~critical dimension~~--. Claims 8-12 depend on claim 7.

In claim 1 line 2 and in claim 13 line 6, both occurrences of the phrase “the steps” lack proper antecedent basis, so this phrase has been interpreted to mean --[[the]] steps-- at both occurrences. Claims 2-6 depend on claim 1.

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In claim 1 line 3, again in lines 4-5, and also in claim 5 lines 1-3, the “transferring” steps are unclear, at least because this term implies conveying, transporting, or copying of a pattern **from** a first location or object portion **onto** a second different location or object portion. In claim 1 line 3, “transferring a first pattern on a substrate in a first area” is unclear about whether the first pattern is being transferred either **from** or **onto** the first area of the substrate and it is also unclear **onto** or **from** what other different object besides the first area of the substrate the first pattern is being transferred. However, for the purpose of this Office action, claim 1 line 3 has been interpreted to mean --~~transferring~~ fabricating a first pattern on a substrate in a first area--. Similarly in claim 1 lines 4-5, “transferring at least one test pattern on the substrate outside of the first area” is also unclear and has been interpreted for the purpose of this Office action to mean --~~transferring~~ fabricating at least one test pattern on the substrate outside of the first area--. Additionally in claim 5 lines 1-3, “further comprising the step of transferring the first pattern and the at least one test pattern substantially simultaneously on the substrate” is unclear for similar reasons as well as because it is unclear whether or not this represents an additional step to those recited in claim 1 (on which claim 5 depends) and if not whether “substantially simultaneously” means these steps are performed at the same time (in accordance with page 5 line 2 of the specification) or are conducted so that they overlap in time; nevertheless for the purpose of this Office action this phrase has been interpreted to mean --~~further comprising~~ wherein the step of ~~transferring~~ fabricating the first pattern and the step of fabricating the at least one test pattern ~~substantially simultaneously~~ on the substrate occur at the same time--. It is also understood from the specification at page 5 line 29 to page 6 line 18 that these patterns are fabricated by forming an opaque layer on the substrate, patterning a resist thereon, then selectively etching by either a

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wet or dry etchant of the opaque layer through the resist pattern (as is conventionally known) to produce the first mask pattern and the at least one test pattern on the substrate.

In claim 2, the phrase “further comprising the step of duplicating a portion of the first pattern” lacks proper antecedent basis for “the step of duplicating” and is also unclear about whether or not this is an additional step beyond those recited in claim 1 (on which claim 2 depends). However, for the purpose of this Office action, this phrase has been interpreted to mean --~~further comprising~~ wherein the step of fabricating the at least one test pattern comprises duplicating a portion of the first pattern--. Claims 3-4 depend on claim 2.

In claims 2-3 and 8-9, all five occurrences of the phrase “the test pattern” lack proper antecedent basis to the previous phrase “at least one test pattern” in claim 1 line 4 (on which claims 2-3 depend) and in claim 7 line 5 (on which each of claims 8 and 9 depend), so the above phrase “the test pattern” in claims 2-3 and 8-9 has been interpreted to mean --the at least one test pattern-- at each of all five occurrences. Claim 4 depends on claim 2 via claim 3 and claim 10 depends on claim 9.

In claim 6 line 2, the phrase “further comprising the step of forming the first pattern and the at least one test pattern under substantially the same conditions” is unclear about whether or not this is an additional step to those recited in claim 1 (on which claim 6 depends) and with regard to the extent or degree of similarity between the conditions under which the at least one test pattern and those under which the first pattern are formed on the photomask. For the purpose of this Office action, this phrase has been interpreted in accordance with page 5 lines 2-3 of the specification to mean --~~further comprising~~ wherein the step of ~~forming~~ fabricating the first

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pattern and the step of fabricating the at least one test pattern occur under ~~substantially~~ the same or similar conditions--.

In claim 13 line 5, the phrase "similar in magnitude" is unclear with regard to the extent or degree of similarity between the test pattern critical dimension (CD) and the first pattern CD on the photomask. For the purpose of this Office action, this phrase has been interpreted reasonably broadly to simply mean --similar ~~in magnitude~~--.

***Claim Rejections - 35 USC § 102/103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 5-7, and 11-12 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tanaka et al. (US 2002/0102477).

Tanaka et al. teach masks and methods of making them (abstract, [0004]). In Figure 1 (mask A having an attenuating material surface) and Figure 2 (mask B having a transparent glass surface [0069]), GP is a glass plate substrate, PA is a circuit pattern area centrally located inside a pellicle frame 1g, each 1a is a (first) circuit pattern, 1b a wafer alignment mark transferred onto

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a semiconductor wafer, 1c a reticle alignment mark, 1d a bar code (mark for discrimination) for mask management, 1e a discrimination mark for mask discrimination, 1f a base line adjustment pattern which corrects aging of focusing and position alignment, 1h a critical dimension (CD) monitor pattern, 1i a pattern displacement monitor pattern, 1j a phase angle monitor mark of a half-tone phase shift mask, and 1k another base line adjustment pattern ([0070]). In each of Figures 1 and 2, the reticle alignment marks 1c, the bar code pattern 1d, the discrimination mark 1e, and the base line adjustment patterns 1f and 1k are all test patterns positioned on the mask outside the pellicle frame 1g (so at least these test patterns are not covered by the pellicle attached by pellicle frame 1g to the mask substrate). At least the CD monitor pattern 1h is expected to enable the mask to facilitate accurate measurement of a CD on the mask (*instant claim 7*). The methods of making such masks include steps for fabricating attenuating patterns as illustrated in Figures 3A-3B ([0072], [0075]). Generally, a binary chrome-on-glass mask can be fabricated by patterning a resist layer on a chrome (Cr) layer on a quartz glass plate or substrate and then etching the Cr layer through the resist layer ([0004], *instant claims 1 and 11*). Alternatively, the mask can be fabricated as a halftone phase shift mask (PSM, [0091]-[0092], *instant claim 12*). The first circuit pattern(s) 1a as well as the test patterns 1c, 1d, 1e, 1k (similar to 1f), 1h, 1i, and 1j are all made of the same attenuating material ([0018], [0070]). In the interest of shortened processing time (TAT, turn-around-time) to make patterned masks that result in reduced cost and shortened TAT for patterning semiconductor devices (including large scale integrated (LSI) circuits, [0002], [0006]) by using such patterned masks, it would have been obvious to one of ordinary skill in the art to carry out fabrication of the first circuit pattern(s) and the test patterns on the mask at the same time under the same or similar conditions.



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This is at least because the circuit and test patterns are made from the same material, presumably formed from the same layer on the mask (*instant claims 5-6*).

Claims 2-4, 8-10, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 2002/0102477) in view of Hickman (US 6,812,999) and Tu et al. (US 6,311,319).

While teaching various features of the instant claims as set forth above, Tanaka et al. do not specifically teach: *[1]* duplicating a portion of the first pattern to derive the at least one test pattern (*instant claims 2 and 8*) *[2]* that includes optical proximity correction (OPC) of the at least one test pattern by using shapes selected from serifs, hammerheads, or scattering bars (*instant claims 3-4 and 9-10*); nor *[3]* that in the method of monitoring a CD pattern on the mask, the at least one test pattern critical dimension (CD) is similar to the first pattern CD on the mask (*instant claim 13*).

Hickman teaches methods of correcting exposure defects (title). In reference to the Figure 4 flow chart, it is well known in the art that as resolution increases (on a mask or reticle), finer and more detailed measurements are needed. When desired, resolution may be selectively increased to improve accuracy of an optical correction. For fine reticle regions (e.g., having smaller CDs, etc.), the resolution of measurement may be selectively increased. The type of measurements may vary to accommodate various regions on the same reticle 130 (c5/L3, 26-31). A pellicle 140 on the mask may be designed to have corrective properties (c4/L16-19).

Tu et al. teach a minimized cost methodology involving a variety of optical proximity corrections (OPC's) for solving line end shortening and corner rounding problems (title, abstract, c2/L53-55). Mask OPC takes two principal forms; scatter (scattering) bars and serifs, the latter

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category including hammerheads. A serif is a small square that is added to the corner, or vertex, of a stripe or line on the mask. Vertices may be positive or negative, corresponding to whether they are convex or concave. A positive serif extends the boundaries of a positive vertex while a negative serif reduces the boundaries of a negative vertex. A hammerhead may be viewed as the fusion of two serifs, located on adjacent vertices (c1/L41-52, *instant claims 3-4 and 9-10*).

It would have been obvious to one of ordinary skill in the art at the time of the invention in the masks, methods of fabricating them, and monitoring or measuring of mask CD's taught by Tanaka et al. (as described above) to compensate for exposure pattern defects that would otherwise result from finer resolution mask regions having smaller CD's by utilizing a methodology involving a variety of OPC's (including e.g., serifs, hammerheads, scattering bars, etc. as taught by Hickman and Tu et al.), because this methodology minimizes cost while solving line end shortening and corner rounding optical proximity problems in the patterns, including CD's, formed from such masks (as taught by Tu et al. [2]). In order for an at least one test pattern (e.g., a CD monitor pattern, etc.) to provide representative estimated CD information about a first (circuit or main) pattern CD, the at least one test pattern CD would necessarily have to be either similar to (*instant claim 13*) and preferably derived or even duplicated from a portion of the first pattern CD (*instant claims 2 and 8, [1]*), including applicable OPC's from the first pattern CD into the at least one test pattern CD, because one of ordinary skill in the art would reasonably expect these OPC's to allow sufficient resolution and accurate representation or estimation of the first pattern CD during monitoring and measuring of the at least one test pattern CD [3].

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jsr



**S. ROSASCO  
PRIMARY EXAMINER  
GROUP 1500**